

DEVELOPMENT OF THE INDIGENOUS CONSTRUCTION SECTOR WITH SPECIAL REFERENCE TO PLANT, EQUIPMENT AND TOOLS

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INTRODUCTION

Plant, equipment and tools (in the following generally referred to as PET) of any country or area and at any given time, are results of - as they are a basis for - the prevailing situation of the construction sector and the development situation in general. PET cannot adequately be dealt with detached from other key features of the construction sector. For that reason: before presenting suggestions specifically related to PET, it is imperative to outline a general model for the future indigenous construction sector within which PET will form an integral part.

Unless a totally integrated approach will be applied, the construction sector will never develop into that 'locomotive' of the general development process, which could, and **should**, become its invaluable role. More specifically - to secure a break-through - a bold and comprehensive international inter-disciplinary **systems approach** is required, which may suitably be initiated by UNCHS-HABITAT, and promoted in cooperation with other United Nations bodies, international development banks and national governments.

Background

The complex comprising plant, equipment and tools (PET) is a set of technical instruments for the realization of the entire construction process: from identifying and recovering the raw materials - via the embodiment of the processed materials, in buildings, infrastructure and services - to the maintenance and repair of the composite end products.

In developing countries this process is rarely regarded and practically never handled - legislatively, organizationally, technologically, economically, etc. - as an integrated whole. On the contrary, the general situation is characterized by the coexistence of many incompatible sub-systems, most of which have been developed to function under entirely different circumstances. This situation is detrimental to the development and spreading of viable, appropriate systems of low-cost solutions.

To fully perceive the situation, it is necessary to realize, that any plant and piece of equipment or tool - having been conceived and developed to function optimally at a given time in a specific society and environment - has built into it, not only the specific relevant demands on the end product, but also the specific current laws, technical norms, available services, price and tax structure, incentives/levies, agreements on the labor market, typical ergonomic measures, social and cultural factors, climatic conditions and many other specific traits of that particular society, environment and time. It is essential to realize, that such PET cannot possibly function appropriately in any dissimilar society, environment and time.

In many developing countries the existing PET represents a variety of inconsistent functions, qualitative and quantitative demands, technological norms and levels, traditions, etc. Most of this PET has not been developed for - or even been adapted to suit - an appropriate indigenous development process. In such situations PET can only survive as long as outside mechanisms dominate the process. In fact, there is a striking parallel between transfer of technology and transplantation of human organs. Unless there is an exceptional degree of compatibility between the transferred and the recipient, an expulsion will take place when the intensive medication is withdrawn, sometimes even before.

The potential and the adequate demand for building materials and components are far from sufficient to secure establishment and success of relevant small-scale plants and workshops. For such projects the necessary multidisciplinary expertise is not easily available, and the cost involved in acquiring relevant expertise is often prohibitive. In that way many basic plants are too small to justify typical costs of appropriate expertise, yet all too complicated to be implemented without qualified support. This circumstance often proves to be a fatally decisive factor.

In order to avoid high initial costs, private entrepreneurs and small cooperatives often ask directly for offers on machinery nor complete plants, without entering into any real pre-investment studies. The offers thus received may often be the only source of special knowledge that is obtained prior to purchasing machinery and establishing a plant. In this way numerous projects have started on a weak or wrong basis, and many of such projects have later failed. On the other hand, many potentially sound projects have never been initiated owing to lack of basic information and an adequate starting mechanism.

An outline integrated model for the indigenous construction sector

A successful development of the indigenous construction sector implies, before all, the successful mobilization of the very people, who are yearning for adequate and respectable housing, community facilities and services. Therefore, **low-cost housing** and related community facilities is bound to be a **key area of development**. It is imperative to have devised and applied systems, which ensure, that in a very direct way, low-income groups of people can influence, participate in, and greatly benefit from - this development process. Thus a key criteria for adequateness and viability of such system is, that - supported primarily by legislative measures and organizational, technological and training assistance - low-income families will be able, through their own initiative and efforts, gradually to make/acquire and adequate, healthy and durable dwelling in a fitting environment.

A high degree of international standardization of approach is necessary in order to bring down costs to an appropriate level. At the same time it is imperative to establish indigenous command of relevant state-of-the art in key areas of construction technology, and to create the basis for indigenous development, implementation and utilization of new, appropriate products, processes and equipment.

Key features of the necessary integrated approach are:

- a) open-ended zoning and building codes and regulations, which make possible and stimulate step by step upgrading of zones, buildings and services.
- b) integrated, optimized and standardized alternative and complementary materials, components and end products (building envelopes, installations, furnishings, services, etc.), which can be made locally, chiefly from local resources, with a minimum of electromechanical plant and equipment, with the least of skills and capital investment, and, last but not least, which makes possible and encourages **step-by-step construction** for gradual quantitative and qualitative up-grading from basic shelters and services to adequate medium standard buildings and related facilities.
- c) pre-digested technology packages including standard designs, programmed guides and procedures for the selection of technology and for the establishment and running of plants and workshops producing building materials, machinery, equipment and tool.
- d) pre-processing and approval of building systems and typical projects with regard to planning criteria, finance and organization, this in order to eliminate 'red tape' in connection with the individual building and construction project.
- e) regional cooperation with regard to production of building materials, components, fixtures equipment and tools, in cases where national markets individually are too small to absorb the output of an economic production.

- f) linking dweller-promoted upgrading of dwellings with guaranteed public assistance related to corresponding upgrading of infrastructure and services.
- g) catalytic demonstration operations and rationally planned and managed multiple 'standard' operations in step-by-step construction and upgrading of dwellings, community buildings and services, including training of dwellers, community technicians, managers, instructors, planner and others.
- h) building technology centers and extension services.
- i) standard procedures on appropriate level of sophistication for the finding, assessment, handling, transport and storage, etc. of local raw materials for construction purposes.
- j) on-the-spot training of dwellers and other labors in skills, that are not only necessary or useful in the actual building process, but also such that will help secure good maintenance and stimulate further general development.
- k) encouragement of 'constructive competition' to promote the development process.
- l) stimulation of indigenous innovation within the field of construction methods, materials and PET.

Proposals related specifically to plant, equipment and tools

The successful development of the indigenous construction sector implies the establishment of a very large number of medium-scale and small-scale plants and workshops, as well as the manufacture or acquisition of a countless number of relevant equipment and tools.

Considering PET within the framework of the above outlined integrated model for the indigenous construction sector, the following factors are decisive for appropriate selection, adaptation and development of PET:

- a) locally available raw materials, their identification, selection, extraction (or collection),, handling, transport, storage, processing and application.
- b) natural and easily developed skills of the potential labor force, whether being the dwellers themselves or hired labor.
- c) building and construction materials, components and end products designed/developed on basis of quantitative and qualitative needs, available raw

materials, skills and the requirement to rational, adequate and inexpensive methods and processes.

d) components, which may suitably form part of locally produced machinery, equipment national or local availability and cost of semi-manufactured materials and tools.

e) climatic and other environmental factors on PET, such as temperature, precipitation, conditions of the ground, soil, earthquake, etc.

f) ergonomic data and relevant social and cultural factors that are typical for the specific communities.

g) direct and indirect costs and benefits of alternative materials, parts, processes, etc.

With due regard to all the above-mentioned factors, PET should be selected adapted and developed in processes, that are integrated with the selection, adaptation and development of standardized, coordinated and compatible building materials and components, which result in end products in the form of dwellings and related services.

A high degree of standardization and wide-spread acceptance and use of basic 'models' of PET is imperative in order to help secure low price and adequate availability of spare parts and accessories.

Such an integrated process implies a concerted international action since appropriateness is rarely dependent upon national frontiers. Furthermore, international cooperation can help keep the cost involved on a practicable level.

PLANT

After due selection, adaptation and development of relevant alternative and complementary types and sizes of plants it is proposed:

a) to establish 'model' plants for the purpose of demonstration and training, as part of integrated demonstration operations.

b) to develop series of trade manuals each covering the establishment and running of a specific type of plant, through programmed introduction to and presentation of:

-- a model procedure for making feasibility study for and establishing such type of plant

-- the corresponding know-how necessary to establish and run a basic plant,

-- two to three model projects describes in detail for possible direct application.

- c) to make available the said manuals to development authorities, technical information and training centers, development banks, chambers of commerce, cooperative societies, as well as for interested firms and individuals.
- d) to arrange courses in the use of the manuals.
- e) to organize indigenous consulting services to meet the demand for complementary specialized support.
- f) to establish experimental plants for development purposes.
- g) to establish a feed-back mechanism from plants being established through the said activities, for intermittent updating and further development in cooperation with demonstration and experimental plants.

The manuals are suggested made as loose-leaves in spring-binders to facilitate continuous updating and supplementation. Pre-processing of the information will secure the presentation in a well organized, integrated, predigested for easy overview, comprehension and use by dynamic and intelligent non-specialists with an intermediate educational background. The selected know-how is to comprise the best possible 'rules of thumb', appropriate formulas etc. through letterpress, drawings, tables, graphs, diagrams, photos, etc. In case various environmental circumstances imply different approaches, such differences may be underlined through the use of different type or coloring letter press and illustrations or when suitable - separate binders. The model procedures offered for making feasibility study, etc. are to be presented through algorithms and similar appropriate aids. The algorithms, using the same basic principles as computer programs, would offer the additional advantage, that completed evaluation and decision forms may be subjected to supplementary computer analysis, if or when desired, for instance, as part of the feed-back mechanism mentioned under 18.g.

Typical basic model plants for various scale operations are to be presented in sufficient detail in the manuals to offer adequate guidance and solutions to the most common problems. The projects are to include general drawings and essential specifications of machinery, secondary facilities and possible buildings - besides typical plans for financing, purchasing, production, marketing (if relevant), maintenance, training, safety measures, etc.

EQUIPMENT AND TOOLS

After the selection, adaptation and development of relevant types and variants of equipment and tools, it is proposed:

- a) to develop and establish 'model' plants and workshops for the manufacture of said equipment and tools, for the purpose of demonstration and training.
- b) to develop series of trade manuals, each covering the establishment and running of a specific type of plant or workshop, and each following the same methodology as described above under the heading: Plant.
- c) to organize indigenous consulting services to meet the demand for complementary specialized support.
- d) to establish experimental plants for development purposes.
- e) to establish a feedback mechanism from equipment and tools being used and plants being established through the said activities, for intermittent updating and further development in cooperation with the demonstration and experimental plants.

Conclusion

Development of the indigenous construction sector, as part of - and a possible 'locomotive' for - a genuine and sustained general economic and social development, essentially is a process from within. However, an effective catalyst is necessary to provoke a breakthrough in this process. May this coming meeting make an important contribution towards the conception of the catalyst in question.

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